

PATENT

UNIVERSAL DUMPSTER

CROSS REFERENCE TO RELATED APPLICATIONS

[001] This application is a continuation-in-part of co-pending United States Application No. 09/968,187 filed October 1, 2001, now United States Patent 6,702,135 issued March 9, 2004, which is a continuation-in-part of United States Application No. 09/428,169 filed October 27, 1999, now United States Patent 6,296,132 issued October 2, 2001.

FIELD OF THE INVENTION

[002] The invention relates to a dumpster for collecting, containing and controlling solid waste at a refuse collection site. More particularly, the invention is a universal dumpster adapted for use with both a front loading and a roll-off refuse collection truck.

BACKGROUND OF THE INVENTION

[003] Proper collection, containment, control, transportation and disposal of solid waste are necessary for protecting public health and safety and for promoting a clean environment. Containers, commonly known as dumpsters, that hold large quantities of solid waste generated at multifamily residential, institutional, commercial, industrial, and construction sites, are an important tool in the management of solid waste.

[004] There are at least two types of dumpsters for handling solid waste, the "front loader" dumpster and the "rear loader" dumpster. Present dumpster designs incorporate several common features including: a floor, side walls, and end walls which together define an interior

compartment; openings through which solid waste is placed into the interior compartment; openings through which the solid waste is discharged out of the interior compartment; and means for supporting the dumpster while the solid waste is being discharged.

[005] The front loader type dumpster is typically used at multifamily residential and light commercial sites and is provided with sleeves fixed to the exterior of the side walls to receive the lifting arms of a front loading truck. The front loading truck approaches the front loader dumpster and positions the arms of the truck within the sleeves of the container. The driver then activates a hydraulic system which lifts the dumpster over the cab of the truck and rotates it to a substantially inverted position to discharge the solid waste into a larger container on the back of the truck, generally referred to as a hopper. Next, the driver lowers the empty dumpster and withdraws the lifting arms of the front loading truck from the sleeves. The driver may then activate a compactor blade in the hopper to compact the solid waste and thereby increase the amount of solid waste that the hopper can accommodate. The front loading truck then travels to the location of the next front loader dumpster to repeat the procedure until the hopper is full. Once the hopper is full, the front loading truck travels to a disposal site, such as a landfill, to dispose of the solid waste.

[006] The rear loader type dumpster is larger than a front loader type dumpster and is typically used at heavy commercial, industrial and construction sites. Rather than being emptied into the hopper of a front loading truck, the rear loader dumpster is pulled onto the bed of a roll-off truck and transported to the disposal site. A typical roll-off truck is equipped with a winch and roller system which positions the dumpster onto the bed of the truck for transportation to the disposal site. Once at the disposal site, the bed and dumpster are tilted so that the solid waste is discharged through one or more rear doors provided in the end wall of the dumpster, much like a dump truck. After being emptied, the rear loader dumpster is returned to the same or a different refuse collection site.

[007] Utilizing different types of dumpsters which each require a different method of discharging the solid waste reduces both the cost effectiveness and the efficiency of solid waste collection.

Conventional front loader type dumpsters are relatively small and are not provided with a door in an end wall of the dumpster. Furthermore, because the solid waste in a conventional front loader dumpster must be discharged through an opening in the top of the dumpster, it cannot be emptied by a roll-off truck. Conventional rear loader type dumpsters are wider than front loader type dumpsters and are not provided with sleeves. As such, a rear loader dumpster cannot be emptied by a front loading truck. Accordingly, solid waste collection would be more cost effective and efficient if the two types of dumpsters could be combined into a single universal dumpster which can be emptied by either a front loading truck or a roll-off truck.

[008] A major environmental concern is the accidental dispersal of solid waste from a front loader dumpster while the solid waste is being discharged into the hopper of the front loading truck. For example, a sudden gust of wind may disperse some of the solid waste onto the ground surrounding the front loading truck as the front loader dumpster is being emptied. Front loader dumpsters are discharged at refuse collection sites that are typically located in areas where people live and work. Thus, the solid waste that is accidentally dispersed has a negative impact on the public health and safety, as well as the local environment.

[009] Conventional designs for front loader dumpsters pose additional safety concerns. The sleeves of a front loader dumpster that engage the lifting arms of a front loading truck are typically welded onto the exterior surface of the side walls of the dumpster. Because the solid waste in a conventional front loader dumpster is discharged through an opening in the top, the dumpster must be completely inverted to discharge all of the solid waste from the interior compartment. Completely inverting the dumpster induces shock stresses on the welds holding the sleeves to the side walls because the weight of the dumpster suddenly shifts from the top of the sleeves to the bottom of the sleeves as the dumpster is inverted. Over time, the welds holding the sleeves to the side walls can weaken and ultimately break from repeated emptying of the dumpster. As a result, the dumpster could fall onto the front loading truck as it is being inverted to discharge the solid waste, potentially injuring workers or passersby.

[010] In addition to posing a safety hazard, the shock stresses induced on the sleeve welds

reduce the efficiency of front loading trucks. The lifting capability of late model front loading trucks usually exceeds the weight capacity of a front loader dumpster. However, because of the danger of the sleeves breaking away from the side walls, the usable volume of a front loader dumpster is limited by a safety factor. If front loader dumpsters were provided with doors in one of the end walls for discharging solid waste, they would not have to be completely inverted to discharge all of the solid waste from the interior compartment of the dumpster. Eliminating the need to completely invert the dumpster would significantly reduce the shock stresses on the welds holding the sleeves to the side walls induced by the sudden shifting of the weight of the dumpster on the sleeves. As a result, dumpsters capable of containing a larger volume of solid waste could be utilized with front loading trucks,

[011] For the foregoing reasons, it is apparent that a need exists for a universal dumpster that can be emptied by either a front loading truck or a roll-off truck. A need also exists for a universal dumpster that minimizes, and preferably eliminates, the accidental dispersal of solid waste into the environment during discharge of the solid waste into the hopper of a front loading truck. Finally, there exists a need to increase both the safety of front loader dumpsters and the efficiency of front loading trucks and dumpsters.

SUMMARY OF THE OBJECTS OF THE INVENTION

[012] Accordingly, it is a principal object of the present invention to provide a universal dumpster that is designed and constructed in such a way that it may be emptied by either a front loading truck or a roll-off truck.

[013] It is a further object of the present invention to provide a universal dumpster that minimizes the environmental damage caused by the accidental dispersal of solid waste during discharge of the solid waste into the hopper of a front loading truck.

[014] It is a further object of the present invention to provide a universal dumpster that is designed and constructed to be emptied by a front loading truck without inducing significant

shock stresses on the welds which hold the sleeves to the side walls of the dumpster.

[015] It is a further object of the present invention to provide a universal dumpster that is designed and constructed to be emptied by a front loading truck without exerting excessive forces on the lifting arms of a convention front loading refuse collection vehicle at the beginning of the lifting process.

[016] It is a further object of the present invention to provide a universal dumpster that has an expandable volume.

[017] It is a further object of the present invention to provide a universal dumpster having sufficient lids and doors conveniently located on the dumpster so that solid waste may be placed in all areas of the interior compartment of the dumpster.

SUMMARY OF THE INVENTION

[018] The above objects and others are achieved by a universal dumpster constructed in accordance with the present invention. A universal dumpster according to this invention includes a floor having interior and exterior surfaces. A pair of side walls extend upwardly and generally perpendicularly from the floor. Likewise, a pair of end walls extend upwardly and generally perpendicularly from the floor. The end walls are also generally perpendicular to and attached to the side walls. The floor, side walls and end walls together define an interior compartment for collecting and containing solid waste. A sleeve is fixed to each side wall to engage the pickup arm of a conventional front loading refuse collection vehicle. At least one of the end walls of the dumpster includes at least one door which is movable between a first fully closed position and a second fully opened position which exposes an opening through the end wall for depositing solid waste into the dumpster and discharging the solid waste from the dumpster.

[019] In one preferred embodiment of the invention, the end wall is formed by a downwardly opening lower door hingedly attached to the floor and having a front panel and a pair of side

panels. The front panel and the side panels form a discharge chute when the lower door is in the second fully opened position. In another preferred embodiment, the end wall is formed by a pair of front doors that are movable between a first fully closed position and a second fully opened position. In the fully opened position, the doors form a discharge chute. Each door is hingedly attached to one of the side walls and has a floor panel extending from the base of the door. In another preferred embodiment, the end wall is formed by a pair of front doors that are hingedly attached to a telescoping discharge chute. The telescoping discharge chute is formed by a floor ramp extension panel and side wall extension panels extending upwardly and generally perpendicularly from the floor ramp extension panel. The telescoping discharge chute is attached to the dumpster by at least one telescoping rod.

[020] In addition, the dumpster may be constructed with or without a lid. A lid for a dumpster according to this invention is formed by at least one door which is movable between a first fully closed position and a second fully opened position which allows access to the interior compartment of the dumpster for depositing solid waste. Likewise, at least one of the side walls of the dumpster may be provided with a door that allows access to the interior compartment of the dumpster for depositing solid waste. In yet another preferred embodiment, the dumpster may include at least two wheels attached to the floor of the dumpster and a removable trailer hitch. The wheels and the trailer hitch permit the dumpster to be moved to a location that is accessible to a conventional refuse collection vehicle. In yet another preferred embodiment, the dumpster may include a pair of movable sleeves for reducing the forces exerted on the lifting arms of a conventional front loading refuse collection vehicle at the beginning of the lifting process, thereby further increasing the capacity of the dumpster.

BRIEF DESCRIPTION OF THE DRAWINGS

[021] In view of the aforementioned objects and others, which will more readily appear as the nature of the invention is better understood, the invention consists in the novel combination and arrangement of parts hereinafter more fully described, illustrated and claimed with reference being made to the accompanying drawings in which:

[022] **FIG. 1** is a perspective view of a preferred embodiment of a universal dumpster according to the invention as viewed from the front of the dumpster.

[023] **FIG. 2** is a partial perspective view of the universal dumpster of **FIG. 1** with the discharge chute shown in the fully opened position.

[024] **FIG. 3A** is a partial sectional view of the universal dumpster of **FIG. 1**, taken in the direction indicated by the line 3-3 in **FIG. 1**, with phantom lines indicating the movement of the upper door in the end wall and one of the lid doors from their fully closed positions to their fully opened positions.

[025] **FIG. 3B** is a partial sectional view of the dumpster of **FIG. 2** taken in the direction indicated by the line 3-3 in **FIG. 1**.

[026] **FIG. 4** is a perspective view of the universal dumpster of **FIG. 1** as viewed from the rear of the dumpster.

[027] **FIG. 5A** is a partial perspective view of the universal dumpster of **FIG. 4** with the small inset doors shown in the opened position.

[028] **FIG. 5B** is a partial perspective view of the universal dumpster of **FIG. 4** with the large rear doors shown in the opened position.

[029] **FIG. 6** is an environmental view of the universal dumpster of **FIG. 1** illustrating the lifting arms of a conventional front loading truck engaging the sleeves of the dumpster.

[030] **FIG. 7** is an environmental view of the universal dumpster of **FIG. 1** illustrating the dumpster being lifted and emptied through the front doors into the hopper of a conventional front loading truck.

[031] **FIG. 8A** is an environmental view of the universal dumpster of **FIG. 1** illustrating the dumpster being tilted and emptied through the front doors by a conventional roll-off truck.

[032] **FIG. 8B** is an environmental view of the universal dumpster of **FIG. 1** illustrating the dumpster being tilted and emptied through the rear doors by a conventional roll-off truck.

[033] **FIG. 9** is a partial elevation view and a partial sectional view of another preferred embodiment of a universal dumpster according to the invention.

[034] **FIG. 10** is a sectional view of the universal dumpster of **FIG. 9** taken in the direction indicated by the line 10-10 in **FIG. 9**.

[035] **FIG. 11** is an end view of the universal dumpster of **FIG. 9** taken in the direction indicated by the line 11-11 in **FIG. 9**.

[036] **FIG. 12** is a perspective view of another preferred embodiment of a universal dumpster according to the invention as viewed from the front of the dumpster.

[037] **FIG. 13** is a perspective view of an alternate embodiment of the universal dumpster of **FIG. 12**.

[038] **FIG. 14** is an environmental view of the universal dumpster of **FIG. 12** illustrating the dumpster being pulled from the rear onto a conventional roll-off truck for transportation to a disposal site.

[039] **FIG. 15** is a partial perspective view of another preferred embodiment of a universal dumpster according to the invention as viewed from the front of the dumpster.

[040] **FIG. 16** is a partial perspective view of the universal dumpster of **FIG. 15** with the front doors shown in the opened position.

[041] **FIG. 17** is a partial sectional view of the universal dumpster of **FIG. 15** taken in the direction indicated by the line 17-17 in **FIG. 15**.

[042] **FIG. 18** is a partial sectional view of the universal dumpster of **FIG. 15** taken in the direction indicated by the line 18-18 in **FIG. 17**.

[043] **FIG. 19** is a partial perspective view of another preferred embodiment of a universal dumpster according to the invention as viewed from the front of the dumpster.

[044] **FIG. 20** is a partial perspective view of the universal dumpster of **FIG. 19** with the front doors shown in the fully opened position and the telescoping floor and telescoping side wall extensions shown in the fully extended position.

[045] **FIG. 21** is a partial sectional view of the universal dumpster of **FIG. 19** taken in the direction indicated by the line 21-21 in **FIG. 19**.

[046] **FIG. 22** is a partial sectional view of the universal dumpster of **FIG. 19** taken in the direction indicated by the line 22-22 in **FIG. 21**.

[047] **FIG. 23** is a perspective view of another preferred embodiment of a universal dumpster according to the invention as viewed from the front of the dumpster.

[048] **FIG. 24** is an exploded view of the universal dumpster of **FIG. 23** with the discharge chute shown in the opened position.

[049] **FIG. 25** is a perspective view of another preferred embodiment of a universal dumpster according to the invention.

[050] **FIG. 26** is a perspective view of another preferred embodiment of a universal dumpster according to the invention as viewed from the front of the dumpster.

[051] **FIG. 27** is an environmental view of the universal dumpster of **FIG. 26** illustrating the lifting arms of a conventional front loading truck engaging the sleeves of the dumpster.

[052] **FIG. 28** is an environmental view of the universal dumpster of **FIG. 26** illustrating the dumpster being lifted from the ground by the lifting arms of a conventional front loading truck.

[053] **FIG. 29** is an environmental view of the universal dumpster of **FIG. 26** illustrating the dumpster being emptied through the front doors into the hopper of a conventional front loading truck.

[054] **FIG. 30** is a perspective view of another preferred embodiment of a universal dumpster according to the invention as viewed from the front of the dumpster.

[055] **FIG. 31A** is a partial sectional view of the universal dumpster of **FIG. 30** taken in the direction indicated by the line 31-31 in **FIG. 30** with the discharge chute shown in the closed position.

[056] **FIG. 31B** is a partial sectional view of the universal dumpster of **FIG. 30** taken in the direction indicated by the line 31-31 in **FIG. 30** with the dumpster tilted and the discharge chute shown in the opened position.

[057] **FIG. 32** is an environmental view of the universal dumpster of **FIG. 30** illustrating the lifting arms of a conventional front loading truck engaging the sleeves of the dumpster.

[058] **FIG. 33** is an environmental view of the universal dumpster of **FIG. 30** illustrating the dumpster being emptied through the discharge chute [front doors] into the hopper of a conventional front loading truck.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[059] A number of preferred embodiments of the present invention will be described more fully hereinafter. However, the invention should not be construed as being limited to the embodiments described herein. Rather, it is intended that the invention be construed broadly to encompass any and all embodiments of a dumpster having the disclosed features, or equivalents thereof, which are within the skill of an ordinary person in the relevant art. In the description, like reference numerals designate like or corresponding parts throughout the several figures. It is to be also understood that such terms as "front", "rear", "top", "floor", "side", and "end" are used in the description for purposes of locating one element relative to another and are not to be construed as limiting terms. Finally, it should be understood that the illustrations provided in the figures are for the purpose of describing various exemplary embodiments of the invention, and thus, are not intended to limit the scope of the invention in any manner.

[060] Referring now to the accompanying figures, the invention is a large container, hereinafter referred to as a dumpster, indicated generally at **30**, for the efficient collection, containment, and control of solid waste material. In the broadest sense, the dumpster **30** comprises a floor **40**, opposed side walls **50**, and opposed end walls **60**. The floor **40**, side walls **50** and end walls **60** together define an interior compartment of the dumpster **30** for collecting and containing the solid waste. Dumpster **30** is generally rectangular, but may be constructed to any size and shape which will contain the solid waste efficiently and accommodate the conventional apparatus for compacting and discharging the solid waste from the dumpster. While dumpsters are generally made of a rigid metal, such as steel, the dumpster **30** of the present invention may be made of any rigid and durable material. The floor **40**, the side walls **50** and the end walls **60** are preferably thin and lightweight to permit conventional refuse collection vehicles to lift and transport as much solid waste as possible. However, the dumpster **30** must also be strong and durable enough to withstand repeated lifting, transportation and discharge of the solid waste, as well as prolonged exposure to the elements.

[061] The floor **40** comprises floor plate **42** that is raised above the ground by support feet **44**

attached to the underside of the floor plate **42**. At least one hook **46** is also attached to the floor plate **42** adjacent to at least one of the end walls **60** for pulling the dumpster **30** onto a roll-off truck **R**, as illustrated in **FIG. 14**. The hook **46** is engaged by a conventional winch which pulls the dumpster **30** onto the bed of the roll-off truck **R**. As the dumpster **30** is pulled onto the bed of roll-off truck **R**, the support feet **44** engage rollers which assist the winch in positioning the dumpster **30** on the truck **R** and support the dumpster **30** during transportation. The support feet **44** and hook **46** may be attached to the floor plate **42** by any conventional means, such as welding, which provides a rigid and durable attachment. The floor **40** further comprises a ramp **48** that slopes upwardly from a medial point on the top side of the floor plate **42** in the direction of one of the end walls **60** to facilitate emptying of the solid waste, as will be described hereinafter.

[062] The side walls **50** extend upwardly and generally perpendicularly from the floor **40**. Preferably, at least one of the side walls **50** has an opening **52** formed therein (**FIG. 3A**) which provides access to the interior compartment of the dumpster **30** for depositing the solid waste. More preferably, a door **54** may be provided that is movable from a fully closed position covering the opening **52** to a fully opened position exposing the opening **52**. The door **54** may be provided with a handle **55** to facilitate movement between the fully closed position and the fully opened position. The door **54** is preferably biased in the closed position since it is desirable to cover the opening **52** while the dumpster **30** is being transported or emptied. As is shown in **FIGS. 9-11**, the side walls **50** may comprise angled side portions **51** which taper inwardly to form a neck having a width narrower than that of the remainder of the interior compartment of the dumpster **30**. The neck allows a dumpster **30** having the width of a conventional rear loading dumpster to be emptied into the hopper of a conventional front loading truck **F**.

[063] A pickup sleeve **56** is fixed to each side wall **50**. The sleeves **56** are constructed to accommodate the lifting arms **A** of a conventional front loading truck **F** (**FIG. 6**). In some exemplary embodiments, the pickup sleeves **56** are positioned on the exterior surface of the side walls **50** adjacent the floor **40** of the dumpster **30** and flush with one of the end walls **60** of the dumpster **30** (**FIG. 1-4, 6-8B, 15-16, 19-20**). In other exemplary embodiments, the sleeves **56**

are positioned on the interior surface of the side walls **50** in the space between the floor ramp **48** and the floor plate **42** (**FIGS. 9-11, 12-13, 23-24**). The pickup sleeves **56** may be fixed to the side walls **50** by any conventional means, but preferably are welded to the exterior or interior surface of the side walls **50**.

[064] As best shown in **FIGS. 1 and 2**, in a preferred embodiment of the invention at least one of the end walls **60** is formed by an upwardly opening upper door **62** and downwardly opening lower door **64**. Each of the doors, **62, 64** is movable between a fully closed and a fully opened position. The upwardly opening upper door **62** hangs between the ends of the side walls **50** from a lateral hinge **61**. Handle **63** enables a user to open upper door **62** for the purpose of placing solid waste into the dumpster **30**. Upper door **62** is biased in the closed position by gravity. However, hinge **61** may also be provided with a torsion spring (not shown) for biasing upper door **62** in the closed position. Downwardly opening lower door **64** comprises a front panel **64a** and side panels **65** that overlap the exterior surface of side walls **50** when the lower door **64** is in the fully closed position. The lower door **64** is biased in the closed position by a pre-tensioned torsion spring **66** located along the hinge line formed between the lower door **64** and the floor **40** of the dumpster **30**. Detent latches **67** may be attached to the exterior surface of the side walls **50** to insure that the lower door **64** remains in a closed position until the dumpster **30** is lifted and tilted by a front loading truck **F** to be emptied. When the dumpster **30** is tilted, the lower door **64** opens automatically under the weight of the solid waste in the interior compartment of the dumpster **30**. A discharge chute, for directing the solid waste from the interior compartment of the dumpster **30** into the hopper **H** of the front loading truck **F** (**FIG. 7**), is formed by the front panel **64a** and the side panels **65** of the fully opened lower door **64**. The upper door **62** also opens when the dumpster **30** is lifted and tilted into position for emptying. Preferably, when the lower door **64** is in the fully opened position, the angle of the front panel **64a** relative to the floor **40** of the dumpster **30** corresponds to the angle of the ramp **48** relative to the floor **40**. Thus, the front panel **64a** forms a straight line with the ramp **48**, as shown in **FIG. 3B**. Preferably, at least one stop **68** is provided on the dumpster **30** to prevent the lower door **64** from opening beyond the point where the front panel **64a** and the ramp **48** form a straight line. The stop **68** may be fixed to the floor **40** of the dumpster **30**, as shown in **FIG. 1**, or may be fixed at any other

convenient location on the dumpster 30.

[065] A rear view of the same embodiment of the invention is shown in **FIGS. 4, 5A and 5B**. In the rear view it is apparent that at least one of the end walls 60 is formed by a pair of large rear doors 70 attached to the side walls 50 by opposed vertical hinges 72. Preferably, each of the large rear doors 70 is biased in the closed position by a pre-tensioned spring located along the hinge line formed between the side wall 50 and the end wall 60. Preferably, each of the rear doors 70 has an opening 73 formed therein (**FIG. 5A**) for providing access to the interior compartment of the dumpster 30 to deposit the solid waste. The opening 73 is covered by a small inset door 74 that is movable between a fully closed position and a fully opened position. Preferably, hinges 75 provided between the rear doors 70 and the inset doors 74 are angled relative to vertical to bias the inset doors 74 in the closed position. A handle 76 may also be provided to assist in opening the inset door 74.

[066] The exemplary embodiment of the universal dumpster 30 described above has at least three advantages. First, the open upper door 62 and the open lower door 64 define a funnel that directs the solid waste into the hopper **H** of the front loading truck **F**. The funnel prevents the solid waste from being accidentally dispersed into the surrounding environment as the dumpster 30 is being emptied into the hopper **H** of the front loading truck **F**, as illustrated in **FIG. 7**. Second, because the dumpster 30 is emptied through an end wall 60 instead of through the top, the dumpster 30 empties with a reduced lifting angle **L** relative to horizontal. More specifically, the front loading truck **F** does not have to rotate the dumpster 30 to a substantially inverted position as is required with a conventional front loader dumpster. Accordingly, the lifting angle **L** generates little or no torque reversal. As a result, the dumpster 30 may be made considerably larger than a conventional front loader dumpster. Third, the universal dumpster 30 of this embodiment may be emptied from either end by a conventional roll-off truck **R**, as illustrated in **FIGS. 8A and 8B**.

[067] Another exemplary embodiment of the invention is shown in **FIGS. 9-11**. As previously mentioned, angled side portions 51 of side walls 50 allow dumpster 30 having the width of a

conventional rear loading dumpster to be emptied into the hopper **H** of a conventional front loading truck **F**. This embodiment utilizes pick up sleeves **56** positioned on the *interior* surface of side walls **50** in the space between the ramp **48** and the floor plate **42**. In order to accommodate the sleeves **56**, the space between the ramp **48** and the floor plate **42** is enlarged by the addition of a ramp portion **48a**. Ramp portion **48a** is positioned at less of an angle relative to the floor **40** than that of ramp **48**. Preferably, when the downwardly opening lower door **64** is in the fully opened position, the angle of the front panel **64a** relative to the floor **40** corresponds to the angle of the ramp portion **48a** relative to the floor **40**. Side panels **65** of lower door **64** overlap the interior surface of side walls **50** of the dumpster **30**.

[068] Another exemplary embodiment of the invention is shown in **FIGS. 12 and 13**. This embodiment also utilizes a downwardly opening lower door **64** comprising side panels **65** that overlap the interior surface of side walls **50** of the dumpster **30**.

[069] Another exemplary embodiment of the invention is shown in **FIGS. 15-18**. In this embodiment, at least one of the end walls **60** of the dumpster **30** is formed by a pair of large front doors **80** attached to the side walls **50** by vertical hinges **82** such that the doors **80** are movable between a fully closed position and a fully opened position. Preferably, each door **80** is biased in the closed position by one or more pre-tensioned torsion springs **83** located along the hinge line formed between the side wall **50** and the end wall **60**. Each door **80** comprises an arcuate floor panel **84** attached to the base of the door **80** at an angle relative to the floor **40** that corresponds to the angle of the ramp **48** relative to the floor **40** of the dumpster **30**. When the doors **80** are in the fully opened position, the floor panels **84** overlap one another to form an extension of the ramp **48**. In the closed position, the floor panels **84** retract into the open space **85** between the ramp **48** and the floor plate **42**, as best shown in **FIG. 17**. In the fully opened position, the ramp **48**, doors **80** and floor panels **84** define a funnel for discharging the solid waste from the interior compartment of the dumpster **30**, as previously described.

[070] Another exemplary embodiment of the invention is shown in **FIGS. 19-22**. In this embodiment, at least one of the end walls **60** is formed by a pair of large front doors **90**. The

doors 90 are attached to side wall extension panels 92 by vertical hinges 94 such that the doors 90 are movable between a fully closed position and a fully opened position. Preferably, each door 90 is biased in the closed position by one or more pre-tensioned torsion springs 95 located along the hinge line formed between the side wall extension panel 92 and the door 90. Each side wall extension panel 92 is attached along its base to a floor ramp extension panel 96. The side wall extension panels 92 are connected to telescoping rods 97 which slide between a fully extended position and a fully retracted position to allow the side wall extension panels 92 and the floor ramp extension panel 96 to alternatively telescope outwardly from the dumpster 30 and retract back into the interior compartment of the dumpster 30. The telescoping rods 97 are mounted for movement in sleeves 98 that are fixed to the exterior surface of side walls 50 of the dumpster 30. Preferably, each of the telescoping rods 97 is biased in the fully retracted position by a coil spring 99. The end of the rod 97 is provided with a stop 97a to prevent the side wall extension panel 92 from extending too far. In the fully retracted position, the side wall extension panels 92 overlap the interior surface of the side walls 50 and floor ramp extension panel 96 overlaps the interior surface of the ramp 48 so that the dumpster 30 is available for receiving solid waste in the interior compartment. As the dumpster 30 is tilted for emptying, the side wall extension panels 92 and the floor ramp extension panel 96 slide outwardly from the dumpster 30 as a unit. Once the side wall extension panels 92 and the floor ramp extension panel 96 are fully extended, the doors 90 open outwardly under the weight of the solid waste being discharged from the dumpster 30. Together, the side wall extension panels 92, the floor ramp extension panel 96 and the doors 90 form a telescoping discharge chute for guiding the solid waste out of the interior compartment of the dumpster 30.

[071] Preferably, dumpster 30 has a removable lid 100 which can be opened to allow access to the interior compartment of the dumpster 30 from above and can be closed to prevent refuse from blowing out of the dumpster 30 during transportation and during discharge of the solid waste from the interior compartment of the dumpster 30. In one embodiment, the lid 100 comprises a pair of hinged top doors 102. The top doors 102 may be hinged at the end walls 60 or may be hinged at a medial location between the end walls 60 of the dumpster 30. Each top door 102 of the lid 100 opens upwardly to allow access to the interior compartment of the dumpster 30 to

deposit the solid waste. One or both top doors **102** of the lid **100** may also be removed entirely to allow the dumpster **30** to be utilized, for example, at a construction site to collect and contain large articles of debris, such as building materials. The dumpster **30** may be constructed without any lid **100** as shown in **FIG. 12**. However, the absence of a lid **100** increases the likelihood that solid waste will be accidentally dispersed during discharge of the solid waste into the hopper **H** of a front loading truck **F**, or during transportation by a roll-off truck **R**. In another exemplary embodiment shown in **FIG. 13**, the lid **100** of the dumpster **30** comprises a pair of top doors **106** hinged along the side walls **50** of the dumpster **30**. This alternative embodiment allows use of the dumpster **30** at a construction site, or at another site where large articles of solid waste are generated, without having to remove any portion of the lid **100**.

[072] In another exemplary embodiment, shown in **FIGS. 23** and **24**, the dumpster **30** comprises a removable lid **110** for expanding the usable volume of the dumpster **30**. The lid **110** comprises end walls **112**, side walls **114** and a pair of top doors **116**. A retaining leg **118** provided at each bottom corner of the lid **110** cooperates with a hollow corner post **120** provided at each upper corner of the dumpster to secure the lid **110** on the dumpster **30**. A removable end wall cross bar **122** is also provided to support the end walls **60** of the dumpster **30** when the lid **110** is not in use. The cross bar **122** may be removed to prevent solid waste from catching between the hinged lower door **64** and the hinged end wall **112** during discharge when the lid **110** is in use. The end walls **112** and the side walls **114** of the lid **110** may be adapted for use with any of the exemplary embodiments of the invention shown and disclosed herein.

[073] In some situations, it may be convenient to locate a dumpster **30** in a place that is not readily accessible to either a front loading truck **F** or a roll-off truck **R**. To accommodate these situations, the dumpster **30** could be fitted with wheels **130** and a removable trailer hitch **132** as shown in **FIG. 25**. The wheels **130** and removable trailer hitch **132** permit the dumpster **30** to be moved to a location that is accessible to the refuse collection trucks so that the dumpster **30** may be emptied.

[074] In yet another exemplary embodiment shown in **FIGS. 26-29**, the dumpster **30** reduces

the forces exerted on the lifting arms **A** of a conventional front loading truck **F**. The dumpster **30** is substantially identical to the dumpster shown in **FIGS. 1-8B** except that the floor **40** does not comprise ramp **48** sloping upwardly from a medial point on the top side of the floor plate **42** in the direction of one of the end walls **60**. As a result, the torsion spring **66** is located nearer to the ground. Accordingly, the front loading truck **F** is not required to rotate the dumpster **30** nearly as far to discharge solid waste from the interior compartment of the dumpster **30** into the hopper **H** of the front loading truck **F** (**FIG. 29**). In addition, the pickup sleeves **156** are rotatably mounted to the exterior surface of the side walls **50** adjacent the floor **40** of the dumpster **30**. The pickup sleeves **156** may be rotatably mounted to the side walls **50** in any known manner. As shown, each pickup sleeve **156** comprises a triangular shaped pivot **160** mounted on a cylindrical trunnion pin **162** projecting outwardly from the side wall **50**. Sleeves **156** are interconnected by a relatively large diameter sleeve bar **164** extending transversely between the side walls **50** such that sleeves **156** and sleeve bar **164** form a generally U-shaped lifting tongue.

[075] As previously described, the sleeves **156** are constructed to engage the lifting arms **A** of a conventional front loading truck **F** (**FIG. 27**). However, because the sleeves **156** are rotatably mounted to the side walls **50**, the sleeves **156** will be contacting the ground when the lifting arms **A** initially engage the sleeves **156** of the dumpster **30** (**FIG. 27**). As the lifting arms **A** fully engage the sleeves **156** and begin to lift the dumpster **30**, the sleeves **156** rotate about the pivots **160** on the trunnion pins **162**. As a result, the dumpster **30** is dragged in the direction of the front loading truck **F** until the sleeve bar **164** contacts feet **44** on the underside of the floor **40** of the dumpster **30**. Rotation of the sleeves **156** is terminated once the dumpster **30** has been lifted by the front loading truck **F** approximately sixty degrees relative to horizontal, as depicted by the broken lines in **FIG. 28**. The front loading truck **F** continues to lift the dumpster **30** upwardly and rearwardly so that the dumpster **30** is substantially horizontal above the front loading truck **F**, as depicted by the broken lines in **FIG. 29**.

[076] It should be noted that because the sleeves **156** are rotatably mounted to the side walls **50**, the elevation of the dumpster **30** above the front loading truck **F** is reduced compared to the elevation of the dumpster **30**, as depicted in **FIG. 7**. Accordingly, the center of gravity of the

dumpster **30** is closer to the front loading truck **F** at both the beginning and during the initial stage of the lifting process, and less force is therefore exerted on the lifting arms **A**. As a result, the capacity of the dumpster **30** may be increased somewhat. The lifting arms **A** continue to lift and tilt the dumpster **30** rearwardly approximately 105 degrees until the weight of the solid waste in the interior compartment of the dumpster **30** automatically opens the lower door **64** against the torsion spring **66**, as previously described. The lower dumping position, as depicted by the solid lines in **FIG. 29**, permits the solid waste in the interior compartment of the dumpster **30** to be discharged deeper into the hopper **H** of the front loading truck **F**.

[077] In yet another exemplary embodiment shown in **FIGS. 30-33**, the dumpster **30** further reduces the forces exerted on the lifting arms **A** of a conventional front loading truck **F** and further minimizes the likelihood that refuse will be inadvertently dispersed into the environment while the dumpster is being raised and tipped above the hopper of the front loading truck **F**. At the same time, the amount of travel of the dumpster **30** relative to the front loading truck **F** is limited so that the dumpster **30** cannot tip over the truck **F**. In addition, the embodiment of the dumpster **30** shown in **FIGS. 30-33** permits operation of the packer blade inside the hopper **H** of the front loading truck **F** even when the dumpster **30** is in the raised and tipped position above the hopper **H**. The dumpster **30** is substantially identical to that shown in **FIGS. 26-29** except that one or more mechanical stops **170** are provided to engage the lifting arms **A** of the front loading truck **F** and thereby reduce the amount of stress exerted on the pivots **160** and trunnion pins **162** when the dumpster **30** is raised and tipped above the hopper **H** of the front loading truck **F**, as will be described. Furthermore, the upper door **62** and the lower door **64** are configured to further contain the refuse and to reduce exposure to sideways wind gusts while solid waste is being emptied into the hopper **H** of the front loading truck **F**, as will be described. In addition, rotation of the pickup sleeves **156** about the respective trunnion pins **162** is limited to prevent over-travel while the dumpster **30** is being raised and tipped above the hopper **H** of the front loading truck **F**, as will be described.

[078] As best shown in **FIGS. 30** and **32**, at least one mechanical stop **170** is provided medially on the exterior surface of one of the opposed side walls **50** of the dumpster **30**. Preferably, a

mechanical stop **170** is fixed on each side wall **50** at a predetermined location above the respective pivot **160** such that the distal ends of the lifting arms **A** will engage the mechanical stops **170** when the dumpster **30** is lifted above the hopper **H** of the front loading truck **F**, as illustrated in **FIG. 33**. As shown, the mechanical stop **170** comprises a relatively short L-shaped section of a strong, rigid material, such as angle iron, and is preferably coated, painted or galvanized to inhibit corrosion. However, the mechanical stop **170** may be any known expedient for engaging the lifting arm **A** of the front loading truck **F** and thereby reduce the stress exerted on the lifting arm **A** when the weight of the dumpster **30** shifts over center. For example, the mechanical stop **170** may comprise a piston or elastomeric material for absorbing a portion of the stress exerted on the lifting arm **A** when the weight of the dumpster **30** shifts over center.

[079] The end wall **60** adjacent the lifting sleeves **156** of the dumpster **30** is configured to contain the refuse within the dumpster **30** and to direct the refuse into the hopper **H** of the front loading truck **F** while the dumpster **30** is being emptied. As best shown in **FIG. 31B**, the side walls **50** are chamfered rearwardly towards the floor **40** and the top of the dumpster **30**. The end wall **60** is formed by a large upwardly opening upper door **182** having integral side panels **183** and a relatively smaller downwardly opening lower door **184** having integral side panels **185**. The doors, **182**, **184** are movable between a fully closed and a fully opened position in a clamshell fashion, and together with the chamfered ends of the side walls **50**, define a discharge chute that is enclosed on all four sides. In the fully opened position, the side panels **183** of the upper door **182** and the side panels **185** of the lower door **184** overlap the chamfered ends of the side walls **50** to reduce the likelihood that a sideways gust of wind will inadvertently disperse solid waste into the environment while the dumpster **30** is being emptied into the hopper **H** of the front loading truck **F** (see **FIG. 33**). In addition, the side panels **183** of the upper door **182** eliminate air from traveling sideways across the refuse as it is being discharged. As indicated by the phantom lines in **FIG. 33**, the side walls of the front loading truck **F** may be extended to substantially eliminate the possibility that refuse will be dispersed into the environment while the dumpster is being emptied. The upwardly opening upper door **182** hangs between the ends of the side walls **50** from a lateral hinge **181**. Upper door **182** remains closed under the influence of gravity and is biased in the closed position by a linear compression spring **186** having one end attached to the exterior surface

of the upper door **182** and the other end attached to the top of the dumpster **30** adjacent top door **102** at a medial location between the side walls **50**. Alternatively, hinge **181** may also be provided with a torsion spring (not shown) for biasing upper door **182** in the closed position. Similarly, downwardly opening lower door **184** is biased in the closed position by at least one linear compression spring **188** having one end attached to the exterior surface of the side panel **185** of the lower door **184** and the other end attached to the side wall **50** at a medial location between the floor **40** and the top of the dumpster **30**. As shown, the lower door **184** is provided with a spring **188** on each side panel **185** to insure that the lower door **184** remains in a closed position until the dumpster **30** is lifted and tilted by a front loading truck **F** to be emptied. Furthermore, the lip **189** of the lower door **184** is positioned inwardly of the lip **187** of the upper door **182**. When the dumpster **30** is tilted, the lower door **184** opens automatically under the weight of the solid waste in the interior compartment of the dumpster **30** and forces the upper door **184** to open. The upper door **182** is forced open and over center of the hinge **181** (FIGS. **31B** and **33**) so that the spring **186** retains the upper door **182** in the fully opened position until the influence of gravity causes the upper door **182** to close and the spring **186** to retain the upper door **182** in the fully closed position. Preferably, when the lower door **184** is in the fully opened position, the interior surface of the lower door **184** forms an extension of the floor **40** of the dumpster **30**. Thus, the lower door **184** forms a straight line with the floor **40** as best shown in FIG. **31B** so that the refuse flows smoothly into the hopper **H** of the front loading truck **F** through the discharge chute defined by the upper door **182**, lower door **184** and chamfered side walls **50**. Preferably, at least one stop, such as an extension of the feet **44** on the underside of the floor, is provided on the dumpster **30** to prevent the lower door **184** from opening beyond where a straight line is formed.

[080] As best shown in FIGS. **30** and **32**, at least one safety lock **190** is provided medially on the exterior surface of one of the opposed side walls **50** of the dumpster **30**. Preferably, a safety lock **190** is fixed on each side wall **50** at a predetermined location rearward of the respective pivot **160**. As shown, the safety lock **190** comprises a locking arm **192** rotatably mounted on a pivot pin **194** protruding outwardly from the exterior surface of the side wall **50**. As illustrated in FIG. **33**, the locking arm **192** rotates about the pivot pin **194** when the dumpster **30** is lifted and tilted above the hopper **H** of the front loading truck **F**. The locking arm **192** rotates under the influence

of gravity so that the locking arm **192** remains oriented substantially vertical while the dumpster **30** is lifted and tilted until a protruding lip provided on the locking arm **192** engages a receiving tab **196** affixed to the underside of the corresponding lifting sleeve **156**. Once the lip of the locking arm **192** and the receiving tab **196** of the lifting sleeve **156** are engaged, the dumpster **30** cannot be lifted or tilted any further. Accordingly, over travel is prevented so that the dumpster **30** does not tip over the front loading truck **F**. Preferably, as shown in **FIG. 33**, the locking arm **192** engages the receiving tab **196** and the mechanical stop **170** engages the distal end of the lifting arm **A** with the dumpster **30** in approximately the same location above the hopper **H** of the front loading truck **F**. As shown, the locking arm **192** comprises a generally L-shaped section of a strong, rigid material, such as welded iron, and is preferably coated, painted or galvanized to inhibit corrosion. However, the locking arm **192** may be any known expedient for engaging the lifting sleeve **156** of the dumpster **30** and thereby prevent over travel of the dumpster **30** relative to the front loading truck **F**. As a result, the capacity of the dumpster **30** may be increased.

[081] Utilizing the mechanical stop **170**, the clamshell discharge chute defined by the upper door **172**, the lower door **174** and the chamfered side walls **50**, and the safety lock **190**, the front loading truck **F** is not required to rotate the dumpster **30** nearly as far to discharge solid waste from the interior compartment of the dumpster **30** into the hopper **H** of the front loading truck **F** (compare **FIG. 33** and **FIG. 29**). As a result, the lip **177** of the upper door **172** and the lip **179** of the lower door **174** are clear of the top of the packer blade **PB** when the dumpster **30** is lifted and tilted in the dumping position above the hopper **H** of the front loading truck **F**. As indicated by the phantom lines in **FIG. 33**, the packer blade **PB** is free to move rearward relative to the front loading truck **F** and the dumpster **30** to compact the refuse inside the hopper **H**. Thus, the packer blade **PB** may be extended before, during and even after the dumpster **30** is lifted and tilted.

[082] It is to be understood that the forgoing description and specific embodiments shown herein are merely illustrative of the best mode of the invention and the principals thereof, and that various modifications and additions may be made by those skilled in the art without departing unnecessarily from the spirit and scope of the invention, which is intended to be limited only by the scope of the appended claims.